

Operations Management Summer Camp 2017

Date: Friday, 18 August 2017

Venue: Singapore Management University
Lee Kong Chian School of Business
Level 3, Seminar Room (SR) 3.1

Programme

9.30am - 10.00am	Registration (outside SR 3.1) Morning Refreshment @ Catering area 3A, near SR 3.10, Level 3
10.00am - 10.15am	Opening Speech by Professor Gerry George, Dean of Lee Kong Chian School of Business, Singapore Management University
10.15am - 11.15am	Paper 1 Presenter: GAO Yini, SMU Discussant: Brian TOMLIN, Dartmouth College Title: Homeland Security Games: The Value of Flexible Redeployment <u>Abstract:</u> The classical Colonel Blotto game is one of the earliest games to model conflicts in multiple battlefields. In this paper, we extend the Colonel Blotto game to model homeland security game between a defender and an attacker where the defender can redeploy its resources after observing the attacker's deployment. This asymmetry reflects the locational advantage of the defender who has more time to prepare the battlegrounds. Our goal is to understand the value of this redeployment option in such games, and understand its impact on the attacker's and defender's strategy. In general, finding an equilibrium strategy in this game is challenging. We show the redeployment problem with classic auction contest success function is, in general, NP hard. For a simplified contest success function, when the

redeployment structure has a nice form, such as " k -chain" structure, we obtain closed-form equilibria to these problems. For the game under a general redeployment network structure, we obtain an equivalent reformulation of the game using a conic program. This extends recent LP based approach to characterize the equilibrium strategies in the classical Blotto game.

By analyzing this equivalent conic reformulation, we obtained many interesting properties of the game, i.e. value of the game, defender's strategy, and the marginal moments of attacker's mixed strategy, directly from the conic program. We further explored how the redeployment network structure affects the game, showing that a sparse redeployment network structure can already capture the value of redeployment for the defender.

11.15am - 12.15pm

Paper 2

Presenter: Pascale CRAMA, SMU

Discussant: Sameer HASIJA, INSEAD

Title: Turning the Tables: Licensing Contracts with Reciprocal Options

Abstract:

Research and development collaborations between an innovator and her partner are often signed when one or both parties lack capabilities to successfully bring the product to market on their own, and joint efforts from both parties are needed to create value. However, when either party can attempt to acquire the previously missing capability during the course of the collaboration, evolving capabilities may prompt one party to prefer breaking the contract and continuing alone. Dynamic capabilities bring about two types of risks: whether the other party's capability will be acquired and how well it will be implemented. We find that the extent of these two risks determine the optimality of delaying contracting until after the innovator's capability acquisition outcome or signing buyout contracts, buyback contracts, dual buyout-buyback contracts, and an underutilized novel reciprocal option contract prior to capability acquisition efforts. The reciprocal option differs from typical option contracts in three ways: Either party can make the offer, the strike price of the option is only determined ex-post, at the time of the offer rather than at contract signature, and the party receiving the offer can turn the tables and buy out the party making the offer at the strike price received. We find that these features of the reciprocal options allow them to address inefficient joint development and inefficient product allocation outcomes associated with other contracts but also bring their own inefficiencies. The trade-offs between these efficiencies determine the contract choice. Our model explains why the reciprocal option contract is underused. Moreover, we propose a modification to the contract that could substantially increase its adoption.

12.15pm - 1.30pm	Lunch @ Catering area 3A, near SR 3.10, Level 3
1.30pm - 2.30pm	<p>Paper 3</p> <p>Presenter: Rowan WANG Yu, SMU</p> <p>Discussant: Andrew LIM, National University of Singapore</p> <p>Title: Make-to-Stock Production Systems with Finite Resources</p> <p><u>Abstract:</u> This short paper is strongly motivated by "Benjaafar S, Chen D, Wang R (2017). Managing Production-Inventory Systems with Scarce Resources. Manufacturing & Service Operations Management. 19(2):216-229." Benjaafar et al. (2017) study a periodic-review production inventory system with a finite maximum cumulative production quantity over the planning horizon. The limit on the total production quantity comes from the scarcity of key production input materials. Our paper can be considered as a continuous-review analogue of Benjaafar et al. (2017). Here, we look at a single machine make-to-stock production system with a finite total production quantity, or equivalently, a finite number of demand arrivals. We first consider a system where both the demand inter-arrival times and production times are exponentially distributed. We characterize the optimal control policy and show that the optimal production decision depends on both the inventory level and the number of remaining arrivals. We then extend our analysis to a system with general production time distributions. Our paper, together with Benjaafar et al. (2017), contributes to the understanding of the control of a transient production-inventory system with finite total demand (production quantity).</p>
2.30pm - 3.30pm	<p>Paper 4</p> <p>Presenter: Helen ZHOU Yangfang, SMU</p> <p>Discussant: L. Beril Toktay, Georgia Institute of Technology</p> <p>Title: Is electricity storage green? A study on the commercial sector</p> <p><u>Abstract:</u> We study the environmental impact of electricity storage facilities such as industrial batteries deployed in the commercial sector (e.g., retail stores and corporate offices). We model the problem of managing electricity storage in a commercial building and characterize the structure of the optimal policy in operating storage, generalizing known policy structures in the literature. Our numerical analysis, based on models calibrated to electricity load data for 77 commercial buildings in the U.S., show that for all these buildings, optimal storage operations may increase carbon emissions. We also study the case when commercial buildings are equipped with solar photovoltaic systems.</p>

3.30pm - 4.00pm	Tea Break @ Catering area 3A, near SR 3.10, Level 3
4.00pm - 5.00pm	<p>Paper 5</p> <p>Presenter: Daniel ZHENG Zhichao, SMU</p> <p>Discussant: Nils RUDI, INSEAD</p> <p>Title: Maximizing the Benefits of an On-Demand Workforce: Fill Rate-Based Allocation and Coordination Mechanisms</p> <p><u>Abstract:</u></p> <p>With the rapid growth of the sharing economy, on-demand staffing platforms have emerged to help companies manage their temporary workforce. In this paper, we study how to maximize and distribute the benefits of an on-demand workforce in this new business context. We consider an on-demand staffing platform and multiple employers with uncertain and possibly time-varying demands. To compare this method with traditional staffing solutions, we first investigate when an on-demand staffing platform can be beneficial from the perspective of a central planner. Next, we propose a novel fill rate-based allocation and coordination mechanism that enables the on-demand workforce to be shared optimally when individual employers and the platform operator make decisions in their own interest. Our result provides a win-win-win solution: Individual employers and the platform operator share the maximum benefits of on-demand staffing, while workers are able to set their own hours.</p>
5.00pm - 5.15pm	Concluding Remarks
5.15pm	End of OM Summer Camp 2017

Discussants' Profile:

Sameer Hasija is an Associate Professor of Technology and Operations Management at INSEAD. He earned his PhD in Operations Management and MS in Management Science Methods from the Simon School of Business at the University of Rochester and his BTech from the Indian Institute of Technology Madras.

Sameer's teaching focusses on using a process lens to understand new levers of innovation. Using a systematic analysis of processes within and across firm boundaries, he emphasises the role of process-based innovation in creating new business models and/or fresh competitive positioning for existing business models. Sameer conducts workshops for executives on understanding the latest developments in technology and their role in radically disrupting and/or transforming businesses.

Sameer's current research uses an economics lens to understand the design and management of technology, knowledge, and information intensive service systems.

Andrew Lim is a Professor in the Department of Analytics and Operations at the National University of Singapore. Prior to that, he was on the faculty of the Department of Industrial Engineering and Operations Research at the University of California (Berkeley). His research interests (broadly defined) include stochastic control, robust optimization and financial engineering. He has served on the editorial boards of the IEEE Transactions on Automatic Control and Operations Research.

Nils Rudi is a Professor of Technology and Operations Management and the Abu Dhabi Commercial Bank Chaired Professor in International Management at INSEAD. His research explores operations management with overlap to information systems, marketing, and finance. He has been focusing on supply chain management and how one can use different strategies (e.g., variety postponement, real options, flexibility, financial hedging, and incentive structures) to better handle demand uncertainty. His research has appeared in leading journals such as the Interfaces, Journal of Management Information Systems, Management Science, Manufacturing & Service Operations Management, Operations Research, and Supply Chain Management Review.

After high school, Nils worked for three years as a computer programmer of ERP (Enterprise Resource Planning) systems at Movex. He then formed Minard, specialising in decision support systems for forecasting and inventory management. Minard did an IPO and went public on the Oslo Stock Exchange, Norway, in 1996. Nil's work experience range from consulting for firms in a wide variety of industries to negotiating professional football contracts.

Nils studied part-time for a BS degree in Computer Science at Molde College (Norway) and holds a PhD in Operations Management from the University of Pennsylvania..

L. Beril Toktay holds the Brady Family Chair and is Faculty Director of the Ray C. Anderson Center for Sustainable Business, Professor of Operations Management and ADVANCE Professor. Her primary research areas are sustainable operations and supply chain management. Professor Toktay's research has been funded by several National Science Foundation grants and has received distinctions such as the 2010 Brady Family Award for Faculty Research Excellence and the 2015 *Management Science* Best Paper in Operations Management Award. Her research articles have appeared in refereed journals such as *Management Science*, *M&SOM*, *Operations Research*, *Production and Operations Management* and *Industrial Ecology*. She was elected Distinguished Fellow of the MSOM Society in 2017.

Professor Toktay is Area Editor (Environment, Energy and Sustainability) for *Operations Research*, and Associate Editor for *M&SOM*. She co-edited the *M&SOM* Special Issue on the Environment and was Associate Editor for *Management Science* and Senior Editor for *Production and Operations Management*. She served as the President of the *M&SOM* Society and the VP of Finance of the *POM* Society. At Georgia Tech, she is the Scheller College of Business ADVANCE Professor, a role that is focused on supporting the advancement of women in academia. She is also the Executive Co-Director of Georgia Tech's Serve-Learn-Sustain Quality Enhancement Plan.

Professor Toktay has taught Supply Chain Management courses at the PhD, MBA, and Executive Education levels, as well as Operations Management and Operations Research courses at the PhD level. She has developed cases and pedagogical material for MBA and Executive Education audiences. She currently teaches Business Strategies for Sustainability in MBA and executive education programs.

Brian Tomlin is a Professor of Business Administration at the Tuck School of Business at Dartmouth. He is a department editor for the *Manufacturing & Service Operations Management* journal. He is also a past President of the *Manufacturing & Service Operations Management* society. Brian's research lies in the broad domain of operations and supply chain management, with a particular interest in the areas of supply chain risk and operations innovation. With co-authors, he received the 2012 Wickham Skinner Award for Best Paper published in *Production & Operations Management*, was a finalist for the 2013 *Manufacturing & Service Operations Management* Best Paper Award, and was a finalist for the 2012 INFORMS Daniel H. Wagner Prize for Excellence in Operations Research Practice. Brian received his PhD from MIT's Sloan School of Management, where he was awarded the Zannetos PhD Dissertation Prize. His undergraduate degree is from University College Dublin in Ireland. Prior to his academic career, he worked at General Electric and the Boston Consulting Group.